Pacific Science (1974), Vol. 28, No. 3, p. 247–255
Printed in Great Britain

Reef Corals of Fanning Island[1]

J. E. MARAGOS[2]

ABSTRACT: Recent surveys indicate that the diversity of reef corals at Fanning Island is greater than previously estimated. Most of the approximately 70 species belonging to 32 genera and subgenera typically are found in one of three environments. A turbid lagoon fauna has high abundance but lower diversity of predominantly branching forms. The clear lagoon coral fauna has both high abundance and diversity of predominantly massive and encrusting corals. The greatest number of species and forms of corals are found on the leeward ocean reefs. The abundance and diversity of corals along windward reef slopes are controlled by wave action. Although Fanning and others of the Line Islands presently contain the greatest generic diversity of corals of any island group in the central and eastern Pacific, diversity is considerably less than that reported for island groups in the western Pacific. Geographic isolation appears to be the most plausible factor accounting for reduced coral diversity in the Line Islands. The reef coral fauna is more nearly comparable with that of island groups south and west than to those of the north (Hawaii).

PREVIOUS STUDIES of reef-building corals at Fanning Island (3° N, 159° W, Line Islands) have been confined to collections and surveys of specific areas within the lagoon. A tentative report on the species list of corals collected from Fanning Lagoon (Maragos, Roy, and Smith 1970) suggests that Fanning Island, and perhaps the Line Islands as a group, include a greater variety of reef corals than previously thought (Wells 1954). Other studies indicate that flourishing coral communities exist within the lagoon (Roy and Smith 1971). A second expedition to Fanning in July and August 1972 provides the basis for a description of the distribution and abundance of reef corals from a broad spectrum of both lagoon and ocean reefs. Information gathered during the assemblage of a large coral collection from the atoll is used to compare the relationships of the Fanning fauna with those of coral faunas of other Pacific islands.

[1] Hawaii Institute of Marine Biology contribution no. 434. Hawaii Institute of Geophysics contribution no. 604. Coral Reef Management and Research contribution no. 3. This study was supported by National Science Foundation grant F331-0-260-3230 and NFS Sea Grant 04-3-158-29. Manuscript received 1 September 1973.

[2] University of Hawaii, Department of Oceanography, Honolulu, Hawaii 96822.

METHODS

Fifty reef sites were visited by a team of scientists working from a small skiff; locations of these sites are found in Chave and Eckert (fig. 1, this issue). At each site divers gathered information on various reef organisms, including the corals. Notes on circulation, depth, substrate composition, relief, and other physical properties were also recorded. A reference collection of reef corals was assembled. Skeletons were cleaned in dilute hypochlorite (Clorox) and shipped to Hawaii for analysis. The corals were identified by comparison with reference collections of the author; the Bernice P. Bishop Museum, Honolulu, Hawaii; and the Hawaii Institute of Marine Biology, University of Hawaii, Honolulu, Hawaii. John W. Wells of Cornell University generously identified some of the corals. Useful references consulted include those of Vaughan 1918; Vaughan and Wells 1943; Crossland 1952; Wells 1954, 1956; and Wijsman-Best 1972. A species list of the corals including their relative abundance at Fanning is given in Table 1.

TABLE 1

Species List of Stony Corals from Fanning Island

	DISTRIBUTION			FREQUENCY		
SPECIES	OCEAN	CLEAR LAGOON	TURBID LAGOON	RARE	AVERAGE	ABUNDANT
Acropora sp. cf. *A. abrotanoides* (Lam.)		×	×		×	
Acropora corymbosa (Lam.)†	×			×		
Acropora cymbicyathus (Brook)		×		×		
Acropora sp. cf. *A. delicatula* (Brook)		×	×			×
Acropora formosa (Dana)			×			×
Acropora humilis (Dana)	×				×	
Acropora nasuta (Dana)	×		×		×	
Acropora polymorpha (Brook)	×				×	
Acropora reticulata (Brook)	×	×			×	
Acropora syringodes (Brook)		×	×	×		
Acropora vaughani Wells		×	×		×	
Agariciella ponderosa (Gardiner)	×				×	
Alveopora verrilliana Dana		×			×	
Astreopora sp. cf. *A. gracilis* Bernard			×	×		
Astreopora listeri Bernard	×	×			×	
Astreopora myriophthalma (Lam.)		×	×			×
Astreopora ocellata Bernard		×	×		×	
Coscinaraea ostreaeformis Van der Horst	×			×		
Culicia stellata‡	×			×		
Distichopora violacea (Pallas)‡§	×				×	
Echinophyllia aspera (Ellis & Solander)	×	×			×	
Favia pallida (Dana)			×	×		
Favia speciosa (Dana)	×	×	×			×
Favia stelligera (Dana)	×	×	×			×
Favites abdita (Ell. & Sol.)		×	×	×		
Favites halicora (Ehr.)†	×			×		
Fungia fungites (Linn.)	×	×			×	
Fungia (*Pleuractis*) *scutaria* Lamarck	×	×	×		×	
Fungia (*Verrillofungia*) *concinna* Verrill	×				×	
Herpolitha limax (Esper)	×				×	
Hydnophora microconos (Lam.)	×	×			×	
Hydnophora rigida (Dana)		×	×		×	
Leptastrea purpurea Dana	×	×				×
Leptastrea transversa (Klz.)		×		×		
Leptoria phrygia (Ell. & Sol.)		×		×		
Leptoseris mycetoseroides Wells	×				×	
Lobophyllia costata (Dana)	×	×				×
Merulina ampliata (Ell. & Sol.)	×	×	×			×
Millepora platyphylla Hemp. & Ehr.§	×	×				×
Montipora elschneri Vaughan	×				×	
Montipora hoffmeisteri Wells		×	×		×	
Montipora patula Verrill	×			×		
Montipora socialis Bernard	×	×			×	
Montipora tuberculosa (Lam.)		×	×			×
Montipora verrilli Vaughan	×	×	×			×
Montipora verrucosa (Lam.)		×	×		×	
Pachyseris speciosa (Dana)	×				×	
Parahalomitra robusta (Quelch)	×			×		
Pavona clavus (Dana)	×	×			×	
Pavona divaricata Lam.	×			×		
Pavona gigantea Verrill	×	×			×	
Pavona varians Verrill	×	×				×
Pavona (*Pseudocolumnastraea*) *pollicata* Wells	×				×	
Platygyra lamellina (Ehr.)	×	×	×			×

TABLE 1 (*cont.*)

SPECIES	DISTRIBUTION			FREQUENCY		
	OCEAN	CLEAR LAGOON	TURBID LAGOON	RARE	AVERAGE	ABUNDANT
Platygyra sinensis (M. Ed. & H.)	×	×			×	
Plesiastrea sp. cf. *P. curta* (Dana)		×		×		
Plesiastrea versipora (Lam.)	×		×			×
Pocillopora damicornis (Linnaeus)	×	×	×			×
Pocillopora eydouxi M. Ed. & H.	×				×	
Pocillopora meandrina var. *nobilis* Verrill	×	×				×
Pocillopora molokensis Vaughan		×		×		
Pocillopora paucistellata Quelch			×	×		
Pocillopora verrucosa (Ell. & Sol.)		×			×	
Porites lobata Dana	×	×			×	
Porites lutea M. Ed. & H.			×			×
Porites pukoensis Vaughan		×		×		
Porites (*Synaraea*) *vaughani* Crossland	×				×	
Psammocora contigua (Esper.)		×		×		
Psammocora verrilli Vaughan		×			×	
Psammocora (*Plesioseris*) *profundacella* Gardiner	×	×			×	
Stylaster elegans Verrill‡§	×				×	
Stylophora mordax (Dana)	×	×	×			×
Stylophora pistillata (Esper)			×	×		
Tubastraea coccinea Lesson‡	×	×			×	
Turbinaria veluta Bernard*	×				×	
Total Number	48	46	27	–	–	–
Number of Unique Forms	21	9	5	–	–	–

* Christmas Atoll only.
† Vaughan (1918) only.
‡ Ahermatypes.
§ Hydrozoan corals.

RESULTS

The Lagoon

Fanning Lagoon is a shallow, oval-shaped basin of approximately 116.6 km² with a single deep pass at English Harbor on the west through which 95 percent of lagoon/ocean water exchange occurs (Gallagher et al. 1971; Stroup and Meyers, this issue). Two shallow passes, Rapa on the southeast, and North Pass on the north, are shallow flats less than 1 meter in depth. Because of the restricted movement of water into and out of the lagoon, the physical and chemical character of the lagoon water is noticeably different from that of the oceanic waters (Smith and Pesret, this issue). The lagoon basin is divisible into two areas on the basis of water clarity: a clear water sector in the vicinity of the deep pass (English Harbor) and turbid water sectors where the water clarity is reduced by the presence of suspended calcium carbonate (Smith and Pesret, this issue) in the north and south basins of the lagoon.

The turbid lagoon is characterized by long, narrow, ribbonlike reefs that form networks across the sandy bottom and enclose a number of basins or ponds (Roy and Smith 1971, Gordon and Schiesser 1970). The tops of the line reefs are within 1 meter of the sea surface. The walls have gentle to steep slopes. Coral cover is relatively high considering the amount of sediment cover and sediment in suspension, and average coral cover in one northern pond was estimated to be over 30 percent (Roy and Smith 1971). Lagoon ponds adjacent to North Pass showed higher average coral cover; areas away from the passes showed lower overall cover. Corals grow profusely on the tops and sides of most of the line reefs. Where sand is common, especially on the leeward side of the wider reefs, coral abundance is locally reduced. Corals also grow abundantly on numerous patches and pinnacles on the floor of the ponds. The turbid lagoon in the vicinity of Rapa Pass is shallow and essentially a large sandy reef flat. Numerous microatoll formations of *Porites lutea* occur on this flat.

Where the line reefs and pinnacles reach the sea surface, the reefs are dominated by the branching corals *Stylophora mordax* and *Acropora delicatula*. *Pocillopora damicornis*, *Acropora formosa*, *Platygyra lamellina*, and *Montipora verrucosa* are also common. On the sides of the reefs and pinnacles several varieties of *Acropora* usually occur, and *Astreopora*, *Platygyra*, and *Favia* are common. *Merulina*, *Favites*, *Pavona*, and *Psammocora* are less frequently seen growing under ledges. The unattached solitary coral *Fungia* (*P.*) *scutaria* was also seen on some shallow sand flats in the turbid lagoon. Most of the corals are attached to hard substrate. Except under coral ledges average colony size was large.

A preponderance of branching forms occur in the turbid lagoon as compared with other lagoon environments at Fanning (Roy and Smith 1971). The prevalence of branching forms may imply these forms better resist sedimentation (Roy and Smith 1971) or that they can outcompete other forms for suitable substrates.

Despite the relatively high coral cover, the number of corals characterizing the turbid lagoon environment is few relative to that of other environments at Fanning (Table 1). Only five species of 71 were restricted to the turbid lagoon. The same common species were seen repeatedly at nearly all of the sites surveyed within the turbid lagoon. Environments for reef-building corals in the turbid lagoon appear to be favorable for only a small number of corals which may compete among one another for the limited amount of hard substrate available for coral settlement.

The middle of the lagoon adjacent to the pass at English Harbor comprises the clear lagoon (Chave and Eckert, fig. 1, this issue); this area is characterized by greater depths than occur in the turbid sectors of the lagoon and by clearer water and swifter currents. The line reef network of the turbid lagoon is replaced by concentrations of coral pinnacles of variable size. The larger of these formations are widely spaced and do not restrict exchange of water. Rippled sand dominates the substrates between the patches. These observations indicate that both circulation and exchange of lagoon water occur more readily in the clear lagoon than in the turbid lagoon. The reef coral fauna is more diverse and more abundant than that of the turbid lagoon. Coral coverage is approximately 60 percent in one area of the clear lagoon, and massive and encrusting types of corals predominate (Roy and Smith 1971). The average size of individual colonies appears to be smaller than in the turbid lagoon. Several species of encrusting *Montipora* usually dominate the hard substrate and *Platygyra*, *Favia*, *Porites lobata*, *Pocillopora meandrina*, *Hydnophora*, *Leptastrea*, *Pavona*, *Astreopora*, *Lobophyllia*, and *Plesiastea* are also common. Vertical zonation of corals was not apparent. Most of the species of the clear lagoon were also recorded within either the turbid lagoon or oceanic reef environments. These observations also suggest that clear lagoon habitats for corals are intermediate between oceanic and turbid lagoon environments.

Seaward Reefs

Tradewinds and surf are predominately from the southeast at Fanning, and the character of the windward ocean reefs is grossly different from that of the leeward ocean reefs. Rubble or shingle ramparts are found both offshore on reef flats and onshore along much of the seaward coastline of Fanning. These beaches may have been formed during times when wave action and storm activity were severe (Gallagher 1970). Some of the offshore ramparts enclose old reef flat, forming shallow moats characterized by moderate sediment and currents; water in these moats is oceanic. Coral composition within these moats is not unlike that of the clear lagoon. Although the fauna varies from location to location, *Acropora*, *Pocillopora*, *Psammocora*, *Hydnophora*, and *Favia* are consistently present. Solitary corals of the genus *Fungia* are occasionally found. The abundance and average colony size are usually small, although coral development in the large moat near English Harbor (Danger Point Tidepool of Chave and Eckert, this issue) is locally flourishing.

On reef flats lacking offshore ramparts, coral development is usually poor. Calcareous or fleshy benthic algae apparently outcompete corals on these flats. Coral cover is also low where moving sand is common, especially along some leeward shores. Wide and shallow reef flats occur at Greig Point (Chave and Eckert, fig. 1, this issue) and other localities along the leeward coast. Elsewhere the reef flats are poorly developed and are deeper. Along much of the windward coast (east and southeast) the reef flats are almost nonexistent. Because of the absence of an outer reef edge, waves break near shore. Except for a few hardy forms of *Leptastrea*, *Hydnophora*, and *Pocillopora*, reef corals are nearly absent in these environments. It has been suggested that Fanning Island is tilting so that the windward (eastern) islands are becoming submerged relative to land areas along the western rim (Roy and Smith 1971). This hypothesis may also explain, at least in part, the poor reef flat development along windward coasts.

The deep windward reef slopes were not surveyed in great detail because of logistical problems. The upper slopes appear to be dominated by calcareous red algae (*Porolithon*), and loose shingle is also common within the upper few meters. The groove and spur system is well developed at some locations but is apparently absent or destroyed in others, such as offshore from North Pass. Reef corals are absent from the upper several meters of the windward slopes. Beginning at a depth of 6 meters, a broad shelf extends seaward for several hundred meters. Sediment is absent and reef corals are common, especially encrusting *Millepora*, tabulate *Acropora*, and branching *Pocillopora*. At depths of about 15 meters, coral coverage may be 50 percent or greater. The most common corals include *Acropora reticulata*, *Millepora platyphylla*, *Stylophora mordax*, *Hydnophora microconos*, *Pocillopora meandrina*, and *Favia speciosa*. Between the coral patches are large fields of broken coral fragments and rubble. Reef slope environments may be periodically devastated by large waves and moving rubble. Coral coverage is poor above depths of 10 meters and the fauna is not so diverse as it is off leeward ocean reefs. None of the corals appeared to be unique to windward reefs. These observations suggest that the character of shallow windward reef slopes is strongly controlled by wave action and associated factors.

In contrast to the windward reef slopes, the leeward ocean reef slopes harbor greater abundance and diversity of reef corals. Shingle and calcareous red algae are common within the upper few meters as on the windward reef slopes, but below these depths coral dominates all substrates to depths of 35 meters or more. Average coral abundance for the reef slope north of English Harbor Passage was about 70 percent. Corals (Maragos, this issue) and reef fish (Chave and Eckert, this issue) were found to be strongly zoned with respect to depth. The most common corals along leeward ocean reefs from shallow to progressively greater depths include *Millepora platyphylla*, *Acropora reticulata*, *Pocillopora meandrina*, *Stylophora mordax*, *Favia stelligera*, *Pavona varians*, *Lobophyllia costata*, *Sarcophyton* sp. (a soft coral), *Echinophyllia aspera*, and *Leptastrea purpurea*. Several varieties of solitary unattached fungiid corals were also noted at moderate depths. The bottom of the coral reef slope community terminates at a sand talus which appears to extend to great depths. The great number of coral species and the many unique species found along leeward ocean reefs suggest that habitat diversity is greatest in this area and that environmental conditions are favorable.

DISCUSSION

The coral fauna at Fanning Island can be conveniently classified into turbid lagoon, clear lagoon, and ocean components (Table 1). The degree of circulation, wave action, depth, and sediment cover appear to determine which forms predominate in each of these environments.

The Fanning Island reef coral fauna is much more diverse than previously reported (Wells 1954, Stehli and Wells 1971). Recent investigations (including Maragos, Roy, and Smith 1970) have nearly tripled both the number of species and genera reported from an earlier study at Fanning (Vaughan 1918). Intensive and more efficient collection by SCUBA

TABLE 2

LIST OF SUBGENERA AND GENERA OF REEF-BUILDING CORALS REPORTED IN THE LINE ISLANDS

EXISTING RECORDS		NEW RECORDS
Acropora	*Parahalomitra*	*Agariciella*
Astreopora	*Pavona*	*Alveopora*
*Cyphastrea**	*Platygyra*	*Coscinaraea*
Favia	*Plesiastrea*	*Echinophyllia*
Favites	(*Plesioseris*)	*Fungia*
*Goniastrea**	(*Pleuractis*)	*Leptoria*
Herpolitha	*Pocillopora*	*Leptoseris*
Hydnophora	*Porites*	*Millepora*
Leptastrea	*Psammocora*	*Pachyseris*
Lobophyllia	*Stylophora*	(*Pseudocolumnastraea*)
Merulina	*Turbinaria**	(*Synaraea*)
Montipora		(*Verrillofungia*)

NOTE: Names in parentheses indicate subgenera. Data taken from Wells, unpublished; Wells 1954; Maragos, Roy, and Smith 1970; and the present study.
* Not reported at Fanning Island.

probably accounts for most of the discrepancy, as does sampling in the lagoon which was not previously sampled (Vaughan 1918). The species list of 71 hermatypes should be considered conservative especially for corals belonging to the genera *Montipora* and *Acropora*. Growth form variation noted among individual species of especially these genera during this study has led to some revision of the earlier list (Maragos, Roy, and Smith 1970) compiled without the advantage of reef observations.

Because of the problems associated with growth form variation in corals, systematic treatment at the species level is less reliable than at higher taxonomic levels. For this reason, recent studies of the zoogeography of reef corals are based on the distribution of the subgenera and genera (Wells 1954; Stehli and Wells 1971; Woodhead and Weber 1969; and Weber 1973*a*, *b*).

The new records from Fanning Island increase the number of genera and subgenera of reef corals in the Line Islands from 23 to 35 (Table 2). These results reemphasize the importance of Wells' (1954) discussion of the problems of comparing areas where coral sampling effort is variable. The Line Islands were thought to be an area well sampled for reef corals (Stehli and Wells 1971), even before the recent expeditions to Fanning. No doubt future intensified collection with SCUBA may thus alter the generic coral diversities of any Pacific island group.

The 35 subgenera and genera of reef corals in the Line Islands is the highest number presently reported for any island group to the east of Samoa. However, comprehensive collections have not been assembled from the Phoenix Islands and other central Pacific islands, and future collections may well alter the present pattern. Nevertheless, coral diversity in the Line Islands is not so great as that reported for Samoa, the Marshall Islands, or other island groups of the western Pacific (Wells 1954, Stehli and Wells 1971). The absence of *Heliopora*, *Seriatopora*, *Symphyllia*, and many other common western Pacific corals supports this argument. Stehli and Wells (1971) suggested that the evolution of reef coral genera is occurring more rapidly on the western sides of the Pacific; these areas also show the greatest generic diversity.

Mean annual seawater temperatures are noticeably higher on the western edge than in the central or eastern Pacific (Stehli and Wells 1971). Greatest coral diversities occur where annual seawater temperatures are greater than 80° F (Stehli and Wells 1971). Because the Line Islands are located on the equator and are well within the 80° F isotherm, temperature per se does not appear to explain the lower diversity of corals, at least under present climatological conditions.

The greater number of island groups in the western Pacific may have promoted greater diversification of corals there because of greater habitat space and types (Stehli and Wells 1971). The closer proximity of island groups to one another in this area of the Pacific may tend to reduce geographic isolation and promote homogeneity, and, therefore, greater diversity of corals at each island group. The main Line Islands (Washington, Palmyra, Fanning, and Christmas) are about 1,600 km south, southeast, and northeast of Hawaii, Johnston Island, and the Phoenix Islands, respectively. The Society Islands, Marquesas, and Tuamotus lie 1,800 to 2,300 km south and southeast of the Line Islands. The Cook Islands lie 1,600 km to the southwest. Lack of sufficient island habitat

TABLE 3

SUBGENERA AND GENERA OF REEF CORALS IN THE CENTRAL AND EASTERN PACIFIC

Acanthastrea (2, 3, 5)	*Millepora* (2, 3, 4, 5, 6, 7, 9)
Acropora (2, 3, 5, 6, 9)	*Montipora* (1, 2, 3, 4, 5, 6, 9)
Agariciella (3, 6)	*Mycedium* (3)
Alveopora (1, 5, 6)	*Oxypora* (3)
Astreopora (3, 5, 6, 9)	*Pachyseris* (3, 6)
Coscinaraea (1, 5, 6)	*Parahalomitra* (3, 6)
Cycloseris (1, 3, 7, 8)	*Pavona* (1, 2, 3, 5, 6, 7, 8, 9)
Cyphastrea (1, 2, 3, 5, 6, 9)	*Platygyra* (2, 3, 5, 6, 9)
(*Danafungia*) (3, 9)	*Plesiastrea* (2, 3, 4, 5, 6)
Echinophyllia (3, 6, 9)	(*Plesioseris*) (2, 3, 6)
Echinopora (2, 9)	(*Pleuractis*) (1, 2, 3, 4, 5, 6)
Favia (2, 3, 5, 6)	*Pocillopora* (all)
Favites (2, 3, 5, 6)	*Podabacia* (9)
(*Fungia*) (3, 4, 5, 6)	(*Polyastea*) (3, 7)
Galaxea (2)	*Porites* (all)
Goniastrea (2, 9)	*Psammocora* (all)
Halomitra (3, 5, 9)	(*Pseudocolumnastraea*) (1, 3, 5, 6)
Herpolitha (2, 3, 5, 6, 9)	
Hydnophora (2, 6, 9)	(*Stephanaria*) (1, 7)
Leptastrea (1, 2, 3, 5, 6, 9)	*Stylocoeniella* (2, 3)
Leptoria (2, 6)	*Stylophora* (3, 5, 6)
Leptoseris (1, 3, 5, 6, 7)	(*Synaraea*) (1, 3, 4, 6)
Lobophyllia (2, 3, 5, 6, 9)	*Turbinaria* (2, 3, 6)
Merulina (6)	(*Verrillofungia*) (2, 3, 4, 5, 6)

NOTE: *1*, Hawaiian Islands; *2*, Cook Islands; *3*, Society Islands; *4*, Marquesas Islands; *5*, Tuamotu Islands; *6*, Line Islands; *7*, Panama; *8*, Galápagos Islands; *9*, Phoenix Islands. Names in parentheses indicate subgenera. Data taken from Wells, unpublished; Wells 1954; Stoddart and Pillai 1972; and the present study.

space in the vicinity of the Line Islands could thus be one factor in limiting coral diversity.

Geographic isolation appears to be an important factor in explaining the relatively poor coral diversity of the central Pacific. Although no one island area in the central Pacific is characterized by more than 35 genera or subgenera of corals (Table 3), collectively nearly 50 genera and subgenera are reported from the whole of the central Pacific. If fairly complete collection from these areas is assumed, the figures suggest some isolation between individual island groups.

The Hawaiian Islands are well sampled and form the island chain closest to the Line Islands. However, a markedly different coral fauna is found in Hawaii and generic diversity is low (14). The taxa (*Stephanaria*) and *Cycloseris* are apparently absent in the Line Islands although common in Hawaii. Even more striking is the absence of *Porites compressa* or any branching equivalent of *Porites* at Fanning; branching *Porites* is perhaps the most common Hawaiian form (Maragos 1972). An analogous branching form, *Stylophora mordax*, dominates habitats in Fanning Lagoon which might otherwise be quite favorable for branching *Porites*. Isolation may also explain discrepancies in occurrence of genera among the individual atolls of the Line Islands. Although *Cyphastrea*, *Turbinaria*, and *Goniastrea* have been reported from Christmas or other atolls, I did not find them at Fanning, even after an extensive search.

The islands of the central and eastern Pacific collectively do not show generic coral diversity as high as that exhibited by individual island groups in the central Pacific to the west of Samoa. Thus, not only is isolation between archipelagoes of the central Pacific possible, but isolation of the whole area from the western Pacific is probable.

It has been suggested (Vaughan 1907, and others) that the planula larval stage of corals does not survive long enough to facilitate coral dispersal between island groups separated by wide distances. Although Harrigan (1972) has shown that *Pocillopora* larvae can remain viable and settle after several months, other studies (Maragos 1972) suggest that *Pocillipora* may be adapted for high dispersal associated with better survival in certain reef habitats. Other corals may not produce nearly as many larvae or may not produce planulae that will survive as long as those of *Pocillopora*.

Central Pacific island groups are isolated from the western Pacific in other ways. Prevailing winds and currents tend to move east to west. Since coral planulae probably cannot swim against currents, corals in the central Pacific are essentially "upstream" from the western Pacific, which is the center of evolution of reef corals in the Pacific (Stehli and Wells 1971). Thus, a combination of distance and current patterns may account for isolation, resulting in lower coral diversity of areas in the central and eastern Pacific. The greater similarity of the Line Island coral fauna to that of Marshall Islands suggests that the former fauna was derived recently from areas to the west.

The dissimilarity and low diversity of the

Hawaiian coral fauna suggest the island group is more isolated from the western Pacific than are the Line Islands. Kay (1971) came to similar conclusions regarding the shallow water molluscan fauna of Fanning. Dora Banner and Albert Banner (personal communication) have also noted a lower number of species of alpheid shrimps occurring in Hawaii as compared to that of island groups to the west of Hawaii. This pattern may characterize the distribution of other reef organisms as well.

ACKNOWLEDGMENTS

I would like to thank Edith Chave and Dave Eckert for their assistance and cooperation during the diving surveys. I would also like to thank Keith Chave and Alison Kay for their support and interest. John Wells identified many of the corals. The Hawaii Institute of Marine Biology provided typing assistance.

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